# JOURNAL OF EXPERIMENTAL BOTANY

AN OFFICIAL ORGAN OF THE
SOCIETY FOR
EXPERIMENTAL BIOLOGY

VOLUME 10

OXFORD
AT THE CLARENDON PRESS
1959

*Oxford University Press, Amen House, London E.C.4*

GLASGOW NEW YORK TORONTO MELBOURNE WELLINGTON
BOMBAY CALCUTTA MADRAS KARACHI KUALA LUMPUR
CAPE TOWN IBADAN NAIROBI ACCRA

© *Oxford University Press 1959*

74.214

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY VIVIAN RIDLER, PRINTER TO THE UNIVERSITY

*Editorial Committee*

T. A. BENNET-CLARK (Editor)

E. ASHBY · G. E. BLACKMAN

R. BROWN · F. G. GREGORY

W. O. JAMES · W. H. PEARSALL

R. D. PRESTON · M. THOMAS

# CONTENTS

## NUMBER 28

P. E. Weatherley, A. J. Peel, and G. P. Hill: The Physiology of the Sieve Tube . . . . . 1

J. K. Pollard and F. C. Steward: The Use of $C^{14}$-Proline by Growing Cells: Its Conversion to Protein and to Hydroxyproline 17

G. E. Blackman, G. Sen, W. R. Birch, and R. G. Powell: The Uptake of Growth Substances, I. . . . . 33

A. D. Greenwood: Observations on the Structure of the Zoospores of *Vaucheria*, II . . . . . 55

T. A. Bennet-Clark, A. F. Younis, and R. Esnault: Geotropic Behaviour of Roots . . . . . 69

W. E. Hillis: Shikimic Acid in the Leaves of *Eucalyptus sieberiana* F. Muell . . . . . 87

G. E. Briggs: Bicarbonate Ions as a Source of Carbon Dioxide for Photosynthesis . . . . . 90

W. J. Whittington: The Role of Boron in Plant Growth. . 93

M. Holdsworth: The Effect of Length of Dark Period on the Amplitude of Leaf Movement in *Bauhinia monandra* . . 104

O. Holm-Hansen, K. Nishida, V. Moses, and M. Calvin: Effects of Mineral Salts on Short-term Incorporation of Carbon Dioxide in *Chlorella* . . . . . 109

E. W. Simon: Respiration Rate and Mitochondrial Oxidase Activity in *Arum* Spadix . . . . . 125

M. Black and P. F. Wareing: The Role of Germination Inhibitors and Oxygen in the Dormancy of the Light-sensitive Seed of *Betula* spp. . . . . 134

M. K. Tolba and A. M. Saleh: Utilization of Methionine by Mycelial Felts of *Fusarium Culmorum* . . . . . 146

## NUMBER 29

Foreword . . . . . 155

H. W. B. Barlow and C. R. Hancock: Studies on Extension Growth in Coleoptile Sections, III . . . . . 157

R. Brown: The Growth of the Isolated Root in Culture . 169

J. Edelman, S. I. Shibko, and A. J. Keys: The Role of the Scutellum of Cereal Seedlings in the Synthesis and Transport of Sucrose . . . . . 178

H. MEIDNER and D. C. SPANNER: The Differential Transpiration Porometer . . . . . 190

H. MEIDNER and O. V. S. HEATH: Studies in Stomatal Behaviour, VIII . . . . . 206

C. L. MER: A Study of the Growth and Photoperceptivity of Etiolated Oat Seedlings . . . . . 220

F. L. MILTHORPE: Studies on the Expansion of the Leaf Surface, I . . . . . 233

P. S. NUTMAN: Some Observations on Root-hair Infection by Nodule Bacteria . . . . . 250

H. K. PORTER, R. V. MARTIN, and I. F. BIRD: Synthesis and Dissolution of Starch labelled with $^{14}$Carbon in Tobacco Leaf Tissue . . . . . 264

O. N. PURVIS and E. S. J. HATCHER: Some Morphological Responses of Cereal Seedlings to Vernalisation . . . . 277

F. J. RICHARDS: A Flexible Growth Function for Empirical Use 290

R. SCOTT RUSSELL and V. M. SHORROCKS: The Relationship between Transpiration and the Absorption of Inorganic Ions by Intact Plants . . . . . 301

W. W. SCHWABE: Studies of Long-day Inhibition in Short-day Plants . . . . . 317

D. C. SPANNER: On the Minute Size of Mitochondria . . 330

## NUMBER 30

D. B. IDLE: Studies in Extension Growth, III . . . . 337

CHARLOTTE J. AVERS and R. B. GRIMM: Comparative Enzyme Differentiation in Grass Roots, II. . . . . 341

R. G. HURD: An Effect of pH and Bicarbonate on Salt Accumulation by Disks of Storage Tissue . . . . . 345

S. LAVEE: The Effect of Some Growth-regulating Substances on the Development of *Sclerotium rolfsii* (Sacc.) . . . . 359

R. F. M. VAN STEVENINCK: Factors Affecting the Abscission of Reproductive Organs in Yellow Lupins (*Lupinus luteus* L.), III 367

M. B. WILKINS: An Endogenous Rhythm in the Rate of Carbon Dioxide Output of Bryophyllum, I . . . . . 377

D. DAVIDSON: Changes in the Chromosome Complements of Cells of *Vicia faba* Roots following Irradiation . . . 391

I. K. VASIL: Cultivation of Excised Anthers *in vitro*—Effect of Nucleic Acids . . . . . 399

S. P. SPRAGG and E. W. YEMM: Respiratory Mechanisms and the Changes of Glutathione and Ascorbic Acid in Germinating Peas 409

T. F. NEALES: The Boron Requirement of Flax Roots Grown in Sterile Culture . . . . . 426

L. A. GRIFFITHS: On the Distribution of Gentisic Acid in Green Plants . . . . . 437

K. H. SCHÜTTE: Micro-Nutrient Deficiency and Transpiration in *Tropaeolum majus* L. . . . . 443

I. MANTON: Observations on the Internal Structure of the Spermatozoid of *Dictyota* . . . . . 448

N. P. KEFFORD: Some Growth Regulators of Tobacco in Relation to the Symptoms of the Physiological Disease 'Frenching' . 462

T. A. BENNET-CLARK and A. W. WHEELER: The Metabolism of 3-Indolylacetic Acid in Plant Tissues . . . . . 468

G. E. BLACKMAN and J. A. SARGENT: The Uptake of Growth Substances, II . . . . . 480

I. D. J. PHILLIPS and P. F. WAREING: Studies in Dormancy of Sycamore, II . . . . . 504

# INDEX TO VOLUME 10


AVERS, CHARLOTTE J., and GRIMM. R. B. Comparative Enzyme Differentiation in Grass Roots, II. . . . . 341

BARLOW, H. W. B., and HANCOCK, C. R. Studies on Extension Growth in Coleoptile Sections, III . . . . . 157

BENNET-CLARK, T. A., YOUNIS, A. F., and ESNAULT, R. Geotropic Behaviour of Roots . . . . . 69

BENNET-CLARK, T. A., and WHEELER, A. W. The Metabolism of 3-Indolylacetic Acid in Plant Tissues . . . . . 468

BIRCH, W. R., *see* BLACKMAN, G. E.

BIRD, I. F., *see* PORTER, H. K.

BLACK, M., and WAREING, P. F. The Role of Germination Inhibitors and Oxygen in the Dormancy of the Light-sensitive Seed of *Betula* spp. . . . 134

BLACKMAN, G. E., SEN, G., BIRCH, W. R., and POWELL, R. G. The Uptake of Growth Substances, I . . . . . 33

BLACKMAN, G. E., and SARGENT, J. A. The Uptake of Growth Substances, II 480

BRIGGS, G. E. Bicarbonate Ions as a Source of Carbon Dioxide for Photosynthesis . . . . . 90

BROWN, R. The Growth of the Isolated Root in Culture . . . . . 169

CALVIN, M., *see* HOLM-HANSEN, O.

DAVIDSON, D. Changes in the Chromosome Complements of Cells of *Vicia faba* Roots following Irradiation . . . . . 391

EDELMAN, J., SHIBKO, S. I., and KEYS, A. J. The Role of the Scutellum of Cereal Seedlings in the Synthesis and Transport of Sucrose . . . . . 178

ESNAULT, R., *see* BENNET-CLARK, T. A.

GREENWOOD, A. D. Observations on the Structure of the Zoospores of *Vaucheria*, II . . . . . 55

GRIFFITHS, L. A. On the Distribution of Gentisic Acid in Green Plants . 437

GRIMM, R. B., *see* AVERS, CHARLOTTE J.

HANCOCK, C. R., *see* BARLOW, H. W. B.

HATCHER, E. S. J., *see* PURVIS, O. N.

HEATH, O. V. S., *see* MEIDNER, H.

HILL, G. P., *see* WEATHERLEY, P. E.

HILLIS, W. E. Shikimic Acid in the Leaves of *Eucalyptus sieberiana* F. Muell 87

HOLDSWORTH, M. The Effect of Length of Dark Period on the Amplitude of Leaf Movement in *Bauhinia monandra* . . . . . 104

HOLM-HANSEN, O., NISHIDA, K., MOSES, V., and CALVIN, M. Effects of Mineral Salts on Short-term Incorporation of Carbon Dioxide in *Chlorella* . 109

HURD, R. G. An Effect of pH and Bicarbonate on Salt Accumulation by Disks of Storage Tissue . . . . . 345

IDLE, D. B. Studies in Extension Growth, III . . . . . 337

KEFFORD, N. P. Some Growth Regulators of Tobacco in Relation to the Symptoms of the Physiological Disease 'Frenching' . . . . . 462

KEYS, A. J., *see* EDELMAN, J.

LAVEE, S. The Effect of Some Growth-regulating Substances on the Development of *Sclerotium rolfsii* (Sacc.) . . . . . 359

MANTON, I. Observations on the Internal Structure of the Spermatozoid of *Dictyota* . . . . . 448

MARTIN, R. V., *see* PORTER, H. K.

MEIDNER, H., and SPANNER, D. C. The Differential Transpiration Porometer 190

MEIDNER, H., and HEATH, O. V. S. Studies in Stomatal Behaviour, VIII . 206

MER, C. L. A Study of the Growth and Photoperceptivity of Etiolated Oat Seedlings . . . . . 220
MILTHORPE, F. L. Studies on the Expansion of the Leaf Surface, I . . 233
MOSES, V., *see* HOLM-HANSEN, O.
NEALES, T. F. The Boron Requirement of Flax Roots Grown in Sterile Culture 426
NISHIDA, K., *see* HOLM-HANSEN, O.
NUTMAN, P. S. Some Observations on Root-hair Infection by Nodule Bacteria 250
PEEL, A. J., *see* WEATHERLEY, P. E.
PHILLIPS, I. D. J., and WAREING, P. F. Studies in Dormancy of Sycamore, II 504
POLLARD, J. K., and STEWARD, F. C. The Use of $C^{14}$-Proline by Growing Cells: Its Conversion to Protein and to Hydroxyproline . . . . . 17
PORTER, H. K., MARTIN, R. V., and BIRD, I. F. Synthesis and Dissolution of Starch labelled with $^{14}$Carbon in Tobacco Leaf Tissue . . . . . 264
POWELL, R. G., *see* BLACKMAN, G. E.
PURVIS, O. N., and HATCHER, E. S. J. Some Morphological Responses of Cereal Seedlings to Vernalisation . . . . . 277
RICHARDS, F. J. A Flexible Growth Function for Empirical Use . . . 290
RUSSELL, R. SCOTT, and SHORROCKS, V. M. The Relationship between Transpiration and the Absorption of Inorganic Ions by Intact Plants . . 301
SALEH, A. M., *see* TOLBA, M. K.
SARGENT, J. S., *see* BLACKMAN, G. E.
SCHÜTTE, K. H. Micro-Nutrient Deficiency and Transpiration in *Tropaeolum majus* L. . . . . 443
SCHWABE, W. W. Studies of Long-day Inhibition in Short-day Plants . . 317
SEN, G., *see* BLACKMAN, G. E.
SHIBKO, S. I., *see* EDELMAN, J.
SHORROCKS, V. M., *see* RUSSELL, R. SCOTT
SIMON, E. M. Respiration Rate and Mitochondrial Oxidase Activity in *Arum* Spadix . . . . . 125
SPANNER, D. C. On the Minute Size of Mitochondria . . . . . 330
SPANNER, D. C., *see* MEIDNER, H.
SPRAGG, S. P., and YEMM, E. W. Respiratory Mechanisms and the Changes of Glutathione and Ascorbic Acid in Germinating Peas . . . . . 409
STEWARD, F. C., *see* POLLARD, J. K.
TOLBA, M. K., and SALEH, A. M. Utilization of Methionine by Mycelial Felts of *Fusarium Culmorum* . . . . . 146
VAN STEVENINCK, R. F. M. Factors Affecting the Abscission of Reproductive Organs in Yellow Lupins (*Lupinus luteus* L.), III . . . . . 367
VASIL, I. K. Cultivation of Excised Anthers *in vitro*—Effect of Nucleic Acids 399
WAREING, P. F., *see* BLACK, M.
WAREING, P. F., *see* PHILLIPS, I. D. J.
WEATHERLEY, P. E., PEEL, A. J., and HILL, G. P. The Physiology of the Sieve Tube. . . . . 1
WHEELER, A. W., *see* BENNET-CLARK, T. A.
WHITTINGTON, W. J. The Role of Boron in Plant Growth . . . . . 93
WILKINS, M. B. An Endogenous Rhythm in the Rate of Carbon Dioxide Output of Bryophyllum, I . . . . . 377
YEMM, E. W., *see* SPRAGG, S. P.
YOUNIS, A. F., *see* BENNET-CLARK, T. A.